

Composite Textile Material

Background of the Invention

1. Field of the Invention

The invention relates to composite textile materials.

2. Description of Prior Art

10 The invention relates more particularly to composite
textile materials that have applications in moisture
management. Basically, there is an on-going requirement
15 to make clothing, especially sports clothing, diapers
and incontinent apparel and so forth more comfortable
and healthier to wear and use, even though considerable
moisture or liquids may be liberated by the wearer in
normal use. It is known to provide composite textile
20 materials that comprise distinct layers of materials
having respective appropriate characteristics so that
moisture, or liquid, migrates or drains quickly away
from an inner surface of the material in contact with
the body of a wearer. The liquid may be retained in a
second outer layer in the case of a diaper or evaporate
25 normally from an outer surface of the material where
there is only one layer, in the case of sports clothing,
say.

44B
7A1

Considerable developments have already taken place in providing suitable materials. However difficulties remain especially with multi-layer materials because they are bulky and uncomfortable or certainly difficult to style fashionably. Also, even though the present materials may keep the wearer's skin relatively dry and comfortable in use at first, once an absorbent layer becomes saturated or relatively wet, the moisture or liquid may migrate back towards the body of the user. Presently used composite materials, especially where they are multi-layer, are usually not re-usable.

Summary of the Invention

It is an object of the invention to overcome or to at least reduce this problem.

According to the invention there is provided a composite textile fabric for use in moisture management of textiles and garments, the composite fabric comprising a generally uniformly integrated fabric layer formed with an inner exposed surface that is predominantly hydrophobic material and an outer surface that is predominantly hydrophilic material, whereby the fabric forms a one-way liquid transport system extending away from the inner surface towards the outer surface.

The hydrophilic material may be polypropylene.

The hydrophilic material may be one of polyester and cotton.

5 A re-usable diaper may be provided having an inner layer formed of the composite textile fabric a middle layer formed of treated cotton fabrics, and an outer layer formed of water-proof material.

10 A diaper may be provided having an inner layer formed of the composite textile fabric a middle layer formed of disposable absorbent material, and an outer layer formed of water-proof material.

15 Clothing may be provided with or formed of the composite textile fabric layer, such as boxer or long pants.

20 An incontinent mattress cover including may be provided with the composite textile fabric layer.

Brief Description of the Drawings

25 Composite textile fabric materials and their applications according to the invention will now be described by way of example with reference to the accompanying drawings in which :-

Figure 1 is diagrammatic representation of a cross section of a diaper incorporating the composite textile

material;

Figure 2 is an enlarged cross-section of part of the composite material;

5

Figure 3 shows knitting instructions for forming the composite material;

Figure 4 is a front view of an open diaper;

10

Figure 5 is a plan view of a mattress cover;

Figure 6 is a front view of boxer shorts;

15

Figure 7 is a front view of long pants; and

Figure 8 is different representation of the material of Figure 2.

20

Description of the Preferred Embodiments

Composite textile fabrics and articles made with such materials according to the invention comprise a generally uniformly integrated layer that is formed by a combination of a hydrophobic material and a hydrophilic material. The combination can be made by a number of well-practiced techniques including knitting, weaving and other means, that are used for joining or retaining

25

Sub
A7

materials together to form a fabric. In the formed composite fabric, an inner layer, that normally contacts against a body of a user, is made up predominately of hydrophobic textile material such as polypropylene. In contrast, the outer layer is made up predominately of hydrophilic material. Typically, the inner surface is constituted over its surface with a number of very small areas of the hydrophilic material distributed evenly in the surface of the outer layer. The small areas when totalled together make up typically about 25% of the overall area of the inner surface. When the inner surface is wetted, moisture migrates into the composite fabric via paths formed by hydrophilic material and away from the body of the user.

As such, the composite fabric acts as a one-way liquid transport system that takes moisture immediately away from the body of a user and holds the liquid in the hydrophilic material. Due to the physical distribution of the hydrophobic and hydrophilic materials within the fabric, there is no tendency under normal conditions for moisture, or liquid, to migrate towards the body of the user via the hydrophilic material. A further layer of absorbent material may be combined in the composite fabric or placed against the outer surface to increase the volume of liquid that can be retained, or in effect, stored in the fabric or an article, such as a diaper, incorporating the composite material.

It will be appreciated that the small areas of hydrophilic material may comprise a wide range of percentages of the overall exposed inner surface area of the fabric. Whereas 25% is generally satisfactory and efficient value, the percentage may be considerably higher or lower according to the required use and material or types of those materials that make up the hydrophobic and hydrophilic parts.

Referring to the drawings, in Figure 1 a typical arrangement of a diaper is shown. The composite material is provided as an inner layer 10 formed of hydrophobic material 10A and hydrophilic material 10B. In practice the material 10A is actually uniformly "impregnated" with hydrophilic material 10B by weaving, knitting or any other techniques, so that an exposed upper surface of the layer 10 comprises small areas of the hydrophilic material. The small areas provide passage or ducts for moisture, or liquids to migrate from the upper surface into the bulk of the hydrophilic material 10B of the composite layer. Because the passages each have a small cross-section and are surrounded by hydrophobic material, the composite layer 10 acts as a one-way liquid transport system. An outer absorbent storage layer 12 is provided to collect water from the bulk of the material 10B and a waterproof layer or cover 14 prevents moisture or water dispersing out of the diaper in an otherwise conventional manner.

5 Generally stated, there is no tendency or likelihood of liquid passing towards the exposed upper surface of the layer 10 material 10B to the material 10A, even under gravity during use, and so a surface of a wearer's skin 13 normally remains dry.

10 The layer 10 is re-usable (i.e. washable). For re-usable diapers, the layer 12 can be also be made of re-usable materials. On the other hand, where desired the layer 12 can be made of disposable material and used only once. In this situation, the layer 12 is preferably separately applied or attached to the layer 10 and so that the layer 10 can re-used with a new different layer 12.

15 In another embodiment, the layer 12 is in effect combined with the layer 10, such that when the materials 10A and 10B are knitted or woven together, the layer 12 forms part of the composite layer 10 and is knitted or woven into the layer 10. In that case, the inner surface is formed as before so as to be predominantly made up of hydrophobic material with a number of small exposed areas formed by the hydrophilic material.

20 In any event, the composite layer represents the main departure from the prior art and can be used separately or part of a diaper, an incontinent bed cover, underparts or undnerslips, and so forth. For

44B
44B
CONFID

5 sportswear, the composite material alone can be made up into an article or be part of an article of clothing. Moisture that migrates into the material 10B will evaporate into the atmosphere in normal use and surface of the skin of the wearer will remain dry and comfortable.

10 In Figure 2, part of the upper surface of composite material layer 10 is shown. A strand of hydrophilic material 15 is interspaced with strands of hydrophilic material 16 so that the area (overall) of the upper surface is constituted of about 25% hydrophilic material. Each downward directed part of the strand 15 shown in the Figure represents a narrow passage or duct to transport moisture into the hydrophilic material that predominantly constitutes the lower surface of the composite layer.

20 Where the composite layer is formed by knitting, a suitable knitting structure is shown in Figure 3. The composite material is knitted on a multi-function cylinder and dial and two track knitting machine. Two filament yarns are used. The first yarn is a polypropylene filament yarn with a tenacity of 17.4 tex
25 (double yarn of 8.7 tex) and the second yarn is polyester (Coolmax) filament yarn with a tenacity of 8.5 tex.

44B
44B

5 In Figure 4, the diaper is generally conventional but is provided with a layer 16 of the composite material. The layer 17 may be permanently attached to a re-usable diaper or insertable into a suitable pocket for example, for a disposable diaper. The layer 17 itself is re-usable.

10 In Figure 5, a removable layer 18 of composite material is arranged to fit to or centrally over an incontinent draw sheet or mattress cover formed otherwise of cotton fabric 19 with a central absorbent layer 20.

15 The composite material may also be used in a similar manner, preferably as an insertable layer in clothing such as boxer shorts shown in Figure 6 or long pants shown in Figure 7.

20 It will be appreciated that the term hydrophobic and hydrophilic are comparative terms and depend upon selection of fibres and yarn with different surface tension, contact angle, shape of cross section, diameters of fibres, chemical and physical finishing, and so forth. Thus it will be understood that the terms "hydrophobic" and "hydrophilic" are used in the
25 specification and claims as relative terms. This means that the composite textile fabric is made up of materials that are hydrophobic and hydrophilic relative to one another rather than necessarily having such

es in comparison to a norm
for example.

5403
A19
Cook

NAME	DATE	TIME	LOCATION	REMARKS
John Doe	1950-01-01	10:00	100 Main St	Found lost wallet
Jane Smith	1950-01-02	11:30	50 Elm St	Found lost keys
Bob Johnson	1950-01-03	09:15	200 Oak St	Found lost book
Alice Brown	1950-01-04	12:45	150 Pine St	Found lost bag
Charlie White	1950-01-05	08:30	300 Cedar St	Found lost hat
Diana Green	1950-01-06	13:20	400 Birch St	Found lost shoes
Frank Black	1950-01-07	10:45	600 Walnut St	Found lost camera
Grace Hall	1950-01-08	11:00	800 Maple St	Found lost glasses
Henry King	1950-01-09	09:30	900 Spruce St	Found lost umbrella
Ivy Lee	1950-01-10	12:15	1100 Ash St	Found lost purse
Jack Miller	1950-01-11	10:30	1300 Hickory St	Found lost watch
Karen Wilson	1950-01-12	11:45	1500 Poplar St	Found lost jacket
Leo Taylor	1950-01-13	08:45	1700 Willow St	Found lost bag
Mary Evans	1950-01-14	13:00	1900 Sycamore St	Found lost shoes
Nathan Scott	1950-01-15	10:15	2100 Chestnut St	Found lost camera
Olivia Adams	1950-01-16	11:30	2300 Elm St	Found lost glasses
Peter Baker	1950-01-17	09:00	2500 Oak St	Found lost umbrella
Quinn Carter	1950-01-18	12:30	2700 Pine St	Found lost bag
Rachel Davis	1950-01-19	10:45	2900 Cedar St	Found lost hat
Samuel Evans	1950-01-20	11:15	3100 Birch St	Found lost shoes
Tina Foster	1950-01-21	08:30	3300 Walnut St	Found lost camera
Ulysses Green	1950-01-22	13:45	3500 Maple St	Found lost glasses
Vivian Hall	1950-01-23	10:00	3700 Spruce St	Found lost umbrella
Walter King	1950-01-24	11:30	3900 Ash St	Found lost purse
Xavier Lee	1950-01-25	09:15	4100 Hickory St	Found lost watch
Yvonne Miller	1950-01-26	12:00	4300 Poplar St	Found lost jacket
Zoe Wilson	1950-01-27	10:30	4500 Willow St	Found lost bag
Adam Taylor	1950-01-28	11:45	4700 Sycamore St	Found lost shoes
Bella Scott	1950-01-29	08:45	4900 Chestnut St	Found lost camera
Carl Adams	1950-01-30	13:15	5100 Elm St	Found lost glasses
Dora Baker	1950-01-31	10:45	5300 Oak St	Found lost umbrella
Eugene Carter	1950-02-01	11:00	5500 Pine St	Found lost bag
Freda Davis	1950-02-02	09:30	5700 Cedar St	Found lost hat
Gordon Evans	1950-02-03	12:45	5900 Birch St	Found lost shoes
Helen Foster	1950-02-04	10:15	6100 Walnut St	Found lost camera
Ivan Green	1950-02-05	11:30	6300 Maple St	Found lost glasses
Jane Hall	1950-02-06	08:30	6500 Spruce St	Found lost umbrella
Karl King	1950-02-07	13:00	6700 Ash St	Found lost purse
Laura Lee	1950-02-08	10:45	6900 Hickory St	Found lost watch
Martin Miller	1950-02-09	11:15	7100 Poplar St	Found lost jacket
Nancy Wilson	1950-02-10	09:00	7300 Willow St	Found lost bag
Oscar Taylor	1950-02-11	12:30	7500 Sycamore St	Found lost shoes
Pamela Scott	1950-02-12	10:15	7700 Chestnut St	Found lost camera
Quinn Adams	1950-02-13	11:45	7900 Elm St	Found lost glasses
Rachel Baker	1950-02-14	08:45	8100 Oak St	Found lost umbrella
Samuel Carter	1950-02-15	13:15	8300 Pine St	Found lost bag
Tina Davis	1950-02-16	10:30	8500 Cedar St	Found lost hat
Ulysses Evans	1950-02-17	11:00	8700 Birch St	Found lost shoes
Vivian Foster	1950-02-18	09:30	8900 Walnut St	Found lost camera
Walter Green	1950-02-19	12:00	9100 Maple St	Found lost glasses
Xavier Hall	1950-02-20	10:45	9300 Spruce St	Found lost umbrella
Yvonne King	1950-02-21	11:30	9500 Ash St	Found lost purse
Zoe Lee	1950-02-22	08:30	9700 Hickory St	Found lost watch
Adam Miller	1950-02-23	13:45	9900 Poplar St	Found lost jacket
Bella Wilson	1950-02-24	10:15	10100 Willow St	Found lost bag
Carl Taylor	1950-02-25	11:45	10300 Sycamore St	Found lost shoes
Dora Scott	1950-02-26	09:00	10500 Chestnut St	Found lost camera
Eugene Adams	1950-02-27	12:15	10700 Elm St	Found lost glasses
Freda Baker	1950-02-28	10:30	10900 Oak St	Found lost umbrella
Gordon Carter	1950-02-29	11:00	11100 Pine St	Found lost bag
Helen Davis	1950-03-01	09:30	11300 Cedar St	Found lost hat
Ivan Evans	1950-03-02	12:45	11500 Birch St	Found lost shoes
Jane Foster	1950-03-03	10:15	11700 Walnut St	Found lost camera
Karl Green	1950-03			